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# Evaluation of the $Na^+$ transport properties through a cation exchange membrane by the electrochemical technics: Linear sweep voltammetry (LSV) and chronopotentiometry

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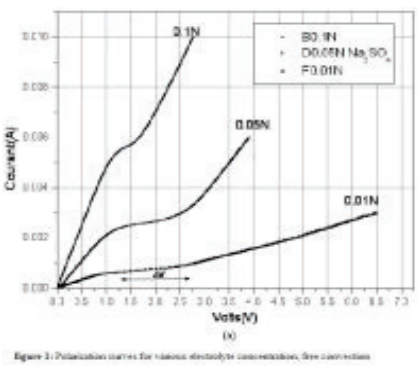
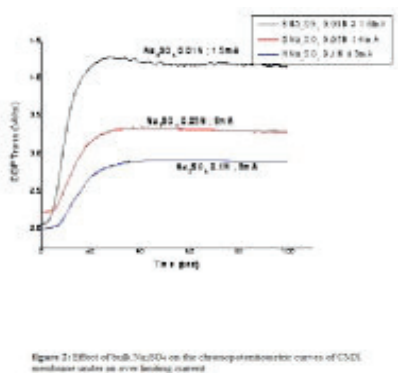
Electrochemical transient methods are recently widely applied for the study of various electromembranaire systems. In this research work the effect of the sodium concentration on the sodium transport properties through an CMX cation exchange membrane was evaluated by Linear sweep voltammetry and chronopotentiometry. The limiting current and the transport numbers were determined by means of these techniques. Our experiments have been obtained automatically (AutolabPGSTAT30) with classical membranes (CMV,CMX) and a four electrodes cell without sttiring. Gold sensing micro electrodes were integrated into the cell. A model between the limiting current density and the bulk sodium concentration was established ($i_{lim}$ = 30. C $^{0.865}$). The figures: 1,2,3 and table 1 presented the obtained results.



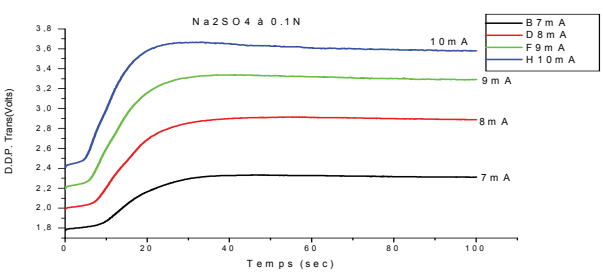



Figure 3 : Chronopotentiometric curves of the CMV membranes in contact with 0.05N $Na_2SO_4$ at different current densities



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Table1: Values of $i\tau^{1/2}$ ( mA s1/2/cm2) as a function of the current density and concentration of counter ion .

| Concentration of counter ion Na+ and imposed current | $\tau_{théo.}$ sec | $\tau_{exp.}$ Sec | $i\tau^{1/2}_{théo.}$ mA.Cm-2 sec1/2 | $i\tau^{1/2}_{exp.}$ mA.Cm-2sec1/2 | $I_{lim}$ mA |
|---|---|---|---|---|---|
| 0,01N ( 2mA) | 4,85 | 1,47 | 4,88 | 4,85 | 0;75 |
| 0,05N (4mA) | 9,32 | 10,20 | 24,43 | 25,54 | 2;6 |
| 0,1N ( 7mA) | 12,88 | 9,00 | 48,86 | 42,57 | 5.6 |

**Conclusion:** Electrochemical technics can bring more information on electromembranaires systems. By studying the evolution of the system in the time domain the transport of the counter ion in every current density for the steady state can be evaluated and internal structure effects as well as the diffusion boundary layers can be separated. This method leads also to determine the ion and electrolyte diffusion coefficients values .

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